SUBJECT:
Air Sampling Pump Calibration Procedure for the
Singer DTM-200 Dry Test Meter

Content

1.0 Purpose / Scope

This document is a written procedure for calibrating air pumps using the Singer Flow Dry Test Meter (also know as a dry gas meter). This procedure provides a simple methodology that will standardizes the calibration procedure and describes the technique that insures that flow rates measured will be as accurate as possible.

The Singer DTM-200 Dry Test Meter was developed to provide a technique for calibrating flow measurements of environmental area pumps. The Singer DTM-200 Dry Test Meter is best used for high volume pumps with flow over 10 liters/minutes.

2.0 Responsibilities

2.1 **Program Administration:** This procedure is administered through the SHSD Industrial Hygiene Group.

2.2 Members of the SHSD Industrial Hygiene Group are required to follow this procedure.

2.3 Other BNL organizations that provide BNL with field monitoring or other hazard assessment services are required to follow this SOP or an equivalent document that ensures an equal or superior method of assessment documentation and recordkeeping.

2.4 Only those personnel who have been trained and have demonstrated competence to the satisfaction of their supervision in the use of this procedure are authorized to complete air pump calibrations.

3.0 Definitions

3.1 *Media:* An assortment of sample devices designed to collect particulate, gases, and vapors into or onto a filter surface, sorbent, or liquid. The most common sampling media include sorbent tubes, filter cassettes, gas sampling bags, cyclones, and impingers.

3.2 *In-Line:* Connecting the sampling medium to the sampling device (such as a filter cassette or sorbent tube cassette to an air-sampling pump via a piece of tubing).

4.0 Prerequisites

4.1 Prior to calibrating any air-sampling pump, verify the operability of all sampling pumps and the Singer DTM-200 Dry Test Meter.

4.2 Prior to operating the Singer DTM-200 Dry Test Meter, verify the qualifications of the personnel conducting the calibrations. **Training prior to using this procedure:**

- 4.2.1 Demonstration of proper operation of the procedure to the satisfaction of the line supervision or the appropriate SHSD IH Program Administrator. See Section 7 for qualification requirements.
- 4.2.2 Other appropriate training for the area to be entered (check with ESH coordinator or FS Representative for the facility).

5.0 Precautions

5.1 Avoid operating the sampling equipment in excessive chemical or water vapor atmospheres.

5.2 **Hazard Determination:** The operation of this test meter in itself does not involve any potential hazards. In the use of the meter to calibrate chemically exposed media, there is a very low potential for exposure to a chemical hazard. The level of exposure does not result in the potential for exposure above occupational exposure limits, but handling of exposed media should be minimized.

5.3 Hazardous Waste is not generated in the use of this meter. This meter has no adverse environmental impact.

5.4 **Personal Protective Equipment**

5.4.1 Hand: Under normal use, hand protection is not required. Contact with highly contaminated media requires the use of disposable gloves. Exam-style, splash gloves are acceptable. Acceptable elastomers are: Nitrile, PVC, and Natural Rubber.

5.4.2 Body: Under normal use, body protection is not required.

5.4.3 Foot: Under normal use, foot protection is not required.

5.4.4 Respiratory: Under normal use, respiratory protection is not required.

5.4.5 Eye: Safety Glasses with side shields are required.

5.1 **Job Risk Assessment:** Consult the *Job Risk Assessment* SHSD-JRA-03 for the hazards and controls of this SOP.

6.0 Procedure

6.1 **Equipment**

6.1.1 Sample Pump (either):

- High volume air pump for environmental work area sampling.
- Personal air-sampling pumps, such as the SKC-224-43XR or the Low flow pump 222-3-Low Flow, for breathing zone sampling

6.1.2 Sample Media (any of these depending on the contaminant)

- Cassettes (37 or 25 mm using various filter media)
- Various sorbent tubes
- Culture Media plate for a microbial impaction sampler

6.1.3 Tubing (for connection between the calibrator, sampling media and the pumps)

6.2 Air temperature, atmospheric pressure, sample media, other environmental factors, battery discharge, and media loading can influence pump capacity. To equalize the effects of these factors, a pump placed in-line with its sample media should be calibrated before and after use in the field sampling session. Calibrations should be done as soon before and after sampling as possible, but in all cases within 24 hours of sampling (exception is line voltage powered pumps). Post calibration must be done prior to recharging battery-operated pumps.

6.3 To minimize the effect of pump and meter variability, take a total of at least 6 (six) pre- and post-calibration readings (minimum 3 pre and 3 post readings) to determine the average pump flow rate.

6.4 To insure that the dry test meter makes accurate measurements, the meter should be calibrated by a NIST traceable source or primary standard annually.

6.5 **Pre-calibration**

6.5.1 Set up the Singer DTM-200 Dry Test Meter on a sturdy surface to prevent vibrations.

6.5.2 Using tubing, attach the end of the sample media that will be open to the environment directly to the Singer DTM-200 Dry Test Meter. *Be sure to remove end plugs from media before attaching to the sampling hose.

6.5.3 Attach the other end of the sample media, with tubing, to the pump.

6.6 **Pre-calibration (prior to field sampling)**

6.6.1 Start the pump and allow to run for five minutes to warm up and stabilize.

6.6.2 Allow the Singer DTM-200 Dry Test Meter to cycle through one revolution.

6.6.3 When the arrow reaches the zero again, start the stopwatch.

6.6.4 Allow the pump to run for exactly one minute.

6.6.5 At precisely the one-minute mark record the reading. (Make sure that at least two full rotations of the meter have been completed. If not, let the meter run for two minutes and divide the results by two.

6.6.6 Record three to six readings on the pump on the sampling forms or sample calibration log.

6.7 **Post-calibration (following field sampling)**

6.7.1 Follow the procedures above.

6.7.2 Record three to six readings on the pump on the sampling forms or sample calibration log.

6.7.3 Remove the sample media from the sample hose and replace end plugs.
6.7.4 Clean all pumps and hoses as needed.
6.7.5 Place cassettes in plastic bags with all paper work.

6.8 **Data Calculations**

6.8.1 Average the pre-calibration and post calibration flow rate values and record on the sampling forms.

7.0 Implementation and Training

Prior to using this procedure, the user:

7.1 Demonstrates proper operation of this instrument to the satisfaction of line supervision or SHSD IH Program Administrator.
7.2 Completes other appropriate training for the area or hazards to be handled (check with ESH coordinator or FS representative for the facility).
7.3 Completes qualification on this procedure listed in *Attachment 9.3 Job Performance Measure* on at least a 3 year basis.
7.4 Personnel are to document their training using the Qualification Criteria listed in *IH51800 Industrial Hygiene Service Delivery Basic Qualification Requirements.*

8.0 References

none

9.0 Attachments

9.1 Photograph of Dry Test Meter
9.2 Qualification Record- Job Performance Measure

10.0 Documentation

Document Development and Revision Control Tracking		
PREPARED BY: **A. Sells** **Date 07/01/00**	**REVIEWED BY:** ***(Signature and date on file*)** **R. Wilson** **IH Lab**	**APPROVED BY:** *(Signature and date on file*) **R. Selvey** **SHSD IH Group Leader**

BROOKHAVEN NATIONAL LABORATORY Safety & Health Services Division **INDUSTRIAL HYGIENE GROUP** Standard Operating Procedure: Field Procedure	NUMBER **IH75160**
	REVISION **FINAL Rev2**
SUBJECT: **Air Sampling Pump Calibration Procedure for the** **Singer DTM-200 Dry Test Meter**	DATE **08/30/06**
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	Date 02/08/01	**Date 02/07/01**
ESH Coordinator/ Date: *none*	Work Coordinator/ Date: *none*	SHSD Manager / Date *none*
QA Representative / Date: *none*	Training Coordinator / Date: *none*	Filing Code: **IH52**
Facility Support Rep. / Date: *none*	Environ. Compliance Rep. / Date: *none*	Effective Date: **03/08/01**
ISM Review - Hazard Categorization ☐ High ☒ Moderate ☐ Low/Skill of the craft	Validation: ☐ Formal Walkthrough ☐ Desk Top Review ☐ SME Review Name / Date:	Implementation: Training Completed: Tracked in BTMS Procedure posted on Web: 11/02/05 Hard Copy files updated: 11/02/05

Revision Log

Purpose: ☐ Temporary Change ☐ Change in Scope ☐ Periodic review ☒ Clarify/enhance procedural controls

Changed resulting from: ☐ Environmental impacts ☐ Federal, State and/or Local requirements ☐ Corrective/preventive actions to non-conformances ☒ none of the above

Section/page and Description of change: Revised format and added SBMS header, added PPE, Hazard Assessment sections, overall update of text in all sections.

R. Selvey 02/07/01*(Signature/date on file*) SME Reviewer/Date:	Reviewer/Date:	Reviewer/Date:

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Section/page and Description of change: Revised SOP number from UH-CP-20.1 to new system IH75150, Re-titled IH75150 Rev0.. Reviewed text contents, no changes needed.

R. Selvey 03/08/01*(signature/date on file)* SME Reviewer/Date:	SME Reviewer/Date:	SME Reviewer/Date:

Purpose: ☐ Temporary Change ☐ Change in Scope ☒ Periodic review ☐ Clarify/enhance procedural controls

Changed resulting from: ☐ Environmental impacts ☐ Federal, State and/or Local requirements ☐ Corrective/preventive actions to non-conformances ☒ none of the above

Section/page and Description of change: Rev1: Revised to include Section 7 Implementation and Training. Text added to Section 2, 4,5, 6, and 7.

R. Selvey 03/29/05 *(signature/date on file)* SME Reviewer/Date:	SME Reviewer/Date:	SME Reviewer/Date:

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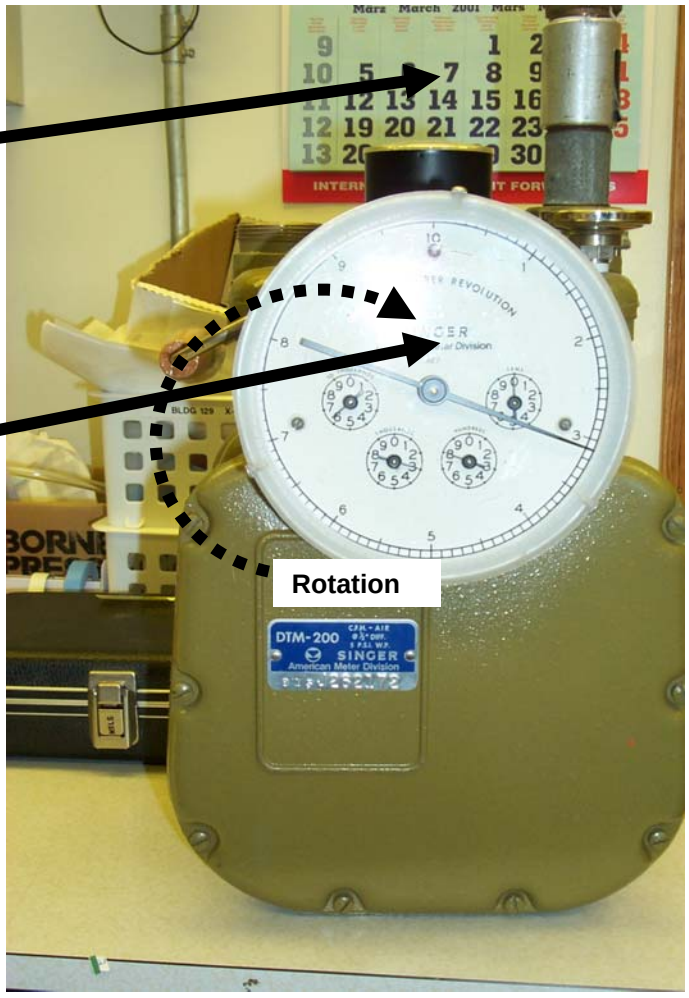
Section/page and Description of change: Added Attachment 9.3 Job Performance Measure

R. Selvey 08/30/06 (signature/date on file) SME Reviewer/Date:	SME Reviewer/Date:	SME Reviewer/Date:

Attachment 9.1
Photograph of the Dry Test Meter

Sample Inlet:
Connect "vacuum" from pump to be calibrated.

Read-out portion of the unit:
Small divisions are in "one-tenth-liters".
Measure the time for the large sweep hand to make at least two complete passes from 1 to 10.



BROOKHAVEN NATIONAL LABORATORY

HP-IHP-75160

SD Industrial Hygiene

Singer DTM-200 Operation

Job Performance Measure (JPM) Completion Certificate

Candidate's Name	Life Number:

Practical Skill Evaluation: Demonstration of Evaluation Methodology by Oral Exam

Criteria	Qualifying Performance Standard	Unsat.	Recov.	Satisf.
1. Personal Protective Equipment	Understands the need to be aware of the potential surface contamination, airborne levels of contaminants, radiological hazards, and noise hazard. Knows how to determine the need for PPE.			
2. Sampling Equipment	Knows where equipment needed for the procedure is located and how to properly sign it out.			
3. Pre-Testing Inspection	Verifies the system to be calibrated is operational and represents operation that will be or has been used during sampling.			
4. DryCal Set up	Knows how to turn on, warm up and operate the Singer DTM-200®.			
5. Measurement of flow	Knows how to properly measure the flowrate of the sampling equipment,			
6. Documentation	Demonstrates correctly filling out IH monitoring forms.			
7. Risk Assessment	Understand the risk assessment and controls described in Job Risk Assessment SHSD-JRA-03.			

I accept the responsibility for performing this task as demonstrated within this JPM and the corresponding SOP.

Candidate Signature:	Date:

I certify the candidate has satisfactorily performed each of the above listed steps and is capable of performing the task unsupervised.

Evaluator Signature:	Date: